

State of California
AIR RESOURCES BOARD

**CALIFORNIA ASSEMBLY-LINE TEST PROCEDURES FOR 1983
~~AND SUBSEQUENT~~ THROUGH 1997 MODEL-YEAR PASSENGER CARS,
LIGHT-DUTY TRUCKS AND MEDIUM-DUTY VEHICLES**

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CALIFORNIA ASSEMBLY-LINE TEST PROCEDURES FOR 1983
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LIGHT-DUTY TRUCKS AND MEDIUM-DUTY VEHICLES

A. GENERAL PROVISIONS

1. APPLICABILITY

These test procedures, adopted pursuant to Section 43210 of the California Health and Safety Code (H & SC), are applicable to vehicle manufacturers of 1983 ~~and subsequent~~ through 1997 model-year liquefied petroleum gas, compressed or liquefied natural gas, methanol, hybrid electric, gasoline, and diesel-powered passenger cars, light-duty trucks, and medium-duty vehicles, except motorcycles, including all Transitional Low-Emission Vehicles (TLEVs), Low-Emission Vehicles (LEVs), and Ultra-Low-Emission Vehicles (ULEVs), subject to registration and manufactured for sale in California; provided that these Test Procedures shall not apply to zero-emission vehicles or medium-duty vehicles certified in accordance to the optional standards and test procedures established in Title 13, CCR, section 1956.8.

2. COMPLIANCE

The procedures specify two types of tests: (1) an inspection test to be applied to every vehicle before sale; and (2) a quality-audit test according to the "CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 1981 AND SUBSEQUENT MODEL PASSENGER CARS, LIGHT-DUTY TRUCKS AND MEDIUM-DUTY VEHICLES" or "CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 1988 AND SUBSEQUENT MODEL PASSENGER CARS, LIGHT-DUTY TRUCKS AND MEDIUM-DUTY VEHICLES," as applicable. Demonstration of compliance with cold temperature carbon monoxide standards shall be exempt from quality-audit testing. A vehicle is in compliance with these assembly-line standards and test procedures when that vehicle is in compliance with the inspection test requirements and that vehicle's engine family is in compliance with the quality-audit test requirements. Since quality-audit evaluations occur less frequently than the inspection tests, a vehicle which passes the inspection test may be presumed to be in compliance with the full assembly-line procedures pending meeting the quality-audit evaluation of that vehicle's engine family.

3. ACCESS

Air Resources Board (ARB) personnel and mobile laboratories shall have access to vehicle assembly plants, distribution facilities, and test facilities for the purpose of vehicle selection, testing, and observation. Scheduling of access shall be arranged with the designated manufacturer's representative and shall not unreasonably disturb normal operations.

4. VARIATIONS AND EXEMPTIONS

Variations from these procedures which produce substantially equivalent results may be authorized by the Executive Officer. In extraordinary circumstances where compliance with these procedures is not possible or practicable, a manufacturer may appeal to the Air Resources Board for a temporary exemption.

5. COMMUNICATIONS

All reports required by these procedures shall be sent to:

Chief, Mobile Source Division
California Air Resources Board
9528 Telstar Avenue
El Monte, CA 91731

Two copies of the report shall be submitted.

B. INSPECTION TEST PROCEDURES -- 1983 AND 1984 MODEL-YEAR VEHICLES

This inspection test shall be performed on all 1983 and 1984 model-year passenger cars, light-duty trucks and medium-duty vehicles subject to these test procedures.

1. INSPECTION TEST PROCEDURES

(a) Functional Test

Functional test of the engine components and control systems which affect emissions shall be made prior to the steady-state emissions tests. If a vehicle fails one or more functional tests, it must be repaired and pass a functional retest before it can be emissions tested.

A list of the items to be functionally checked and a procedure for performing these checks shall be maintained by the manufacturer and may be requested for review at any time after production start-up by the chief, Mobile Source Division. When requested, the manufacturer has up to 30 days to submit a copy of these procedures. Within 60 days of receipt, the Chief, Mobile Source Division, may require revisions.

(b) Steady-State Emissions Test

The vehicle engine shall be adjusted to the manufacturer's specifications for delivery to the customer prior to the steady-state emissions test. This test shall consist of a determination of hydrocarbon (HC) and carbon monoxide (CO) exhaust concentrations with the engine operating in a normal idle condition. All tests, including those of control

limit test vehicles, shall be conducted as follows:

(1) Vehicles shall be tested in the normal "warmed-up" operating temperature range, i.e., after the choke is fully open and the engine is at curb idle speed, but before thermal override devices are actuated to prevent overheating. The test may be performed in any transmission gear; however the same gear shall be used for control limit test vehicles and production vehicles. For each engine family, the idle test may be performed without the air injection system (AIR) instead of with AIR, provided that the control limit vehicles are tested both with and without AIR. The requirements of section B (3)(g) must be met with AIR. The control limit test vehicles and all production vehicles should be warmed-up and tested in the same manner.

(2) The sampling probes of the analytical system shall be inserted into the exhaust outlets far enough to avoid dilution with the outside air. When this is not possible, a tailpipe extension shall be used.

(3) A vehicle which fails a steady-state emissions test shall be retested or repaired and shall pass on retest prior to sale.

2. EVALUATION

Any vehicle tested by the steady-state emissions test showing emissions less than the control limits established for its engine family or subgroup and which had previously passed the functional tests will be considered to be in compliance with the inspection test requirements.

3. CONTROL LIMITS

The control limits for each engine family or subgroup at the start of a model year will be determined as follows:

(a) Measure the emissions from the first 100 vehicles of each engine family or subgroup tested by the steady-state assembly-line inspection test.

(b) Determine the mean emission level and standard deviation for each pollutant (HC and CO).

(c) The control limit for each pollutant is the sum of the mean plus two times the standard deviation for that pollutant.

(d) Until the first control limits are established, the manufacturer shall use temporary control limits based on the first ten tests. These ten vehicles are deemed to meet the control limits so established.

(e) (i) For control systems that do not use catalytic converters -- If the HC control limit value is determined in subparagraph (c) is less than 100 ppm, the HC control value may be increased by up to 50 ppm, not to exceed 100 ppm. If the CO control limit determined in subparagraph (c) is less than 1.0 percent, the CO control limit may be increased by up to 0.5 percent, not to exceed 1.0 percent.

(ii) For control systems that use catalytic converters -- If the HC control limit value determined in subparagraph (c) is less than 50 ppm, the control limit value may be increased by up to 30 ppm, not to exceed 50 ppm.

If the CO control limit determined in subparagraph (c) is less than 0.5 percent, the CO control limit may be increased by up to 0.3 percent, not to exceed 0.5 percent.

(f) Idle control limit values may be rounded to the nearest 10 ppm HC and 0.1 percent CO in conformance to ASTM E29-67, except where this would result in a zero value.

(g) The maximum allowable steady-state control limits for HC and CO are those values used as the idle mode standard shown in Title 13, California ~~Administrative Code~~ Code of Regulations (~~C.A.C.C.C.R.~~) Section 2176 for the applicable model-year or, where applicable model-year standards are not yet adopted, the latest previous model-year values in effect at the time the vehicle is manufactured. An exemption to this requirement will be granted providing the manufacturer submits emission data with each quarterly report listed in one of the following options:

(1) Submit with each quarterly assembly-line report HC and CO emission values measured at engine idle speed for each quality audit vehicle tested and the computed mean and standard deviation of HC and CO emission results for the total number of vehicles tested, by engine family. Measurements of HC and CO shall be conducted immediately following completion of the dynamometer run and vehicles shall be in a state described under B.1 (b)(1) above. If less than 30 vehicles were quality-audit tested during the reporting quarter, the computation of the means and standard deviations are not required.

(2) Submit quarterly HC and CO emission values measured at engine idle speed for a minimum of 30 vehicles in the engine family or sub-group immediately after these vehicles have complied with the assembly-line inspection procedures and have either been run-in a distance of 50 miles (on the road or dynamometer) or after other appropriate engine break-in has been performed and the engine is operating at a fully warmed-up condition as described in b.1 (b)(1) above. In addition to emission results of individual vehicles, the mean and standard deviation shall be computed and submitted.

(3) The manufacturer may propose other methods to achieve results equivalent to the two operations above. These emission data shall be obtained from stabilized vehicles which have

emission control systems with no defects and are properly adjusted to manufacturer's specifications.

(h) Control limits with AIR operating shall be calculated and reported for information purposes for those engine families that are tested without AIR in operation.

Control limit values shall be recalculated for each production quarter based on the measured emissions from at least 100 vehicles produced during the last half of the preceeding quarter of production for each engine family or subgroup tested by the steady-state emissions test. When production levels do not permit compliance with the above, data from vehicles produced during the first half of the preceeding quarter may be used. If the quarterly production of any engine family is less than 100 vehicles, the manufacturer shall use the test results from all vehicles produced during that quarter in determining the control limit values for the next quarter.

The Executive officer shall be notified within one week if control limit values are recalculated following running changes which affect idle emissions levels. The new control limit values and the date they first went into effect shall be part of the notification.

All testing, reports, evaluations, etc., shall be by engine family except when the Executive Officer has approved a breakdown by subgroups (e.g., different carburetors, engine displacements, control systems, transmissions, and inertia weights), by assembly plant, or both.

Note:

Data from any vehicle indicating gross engine malfunction, and/or failure or disconnection of any emission control component, shall be excluded from that used for generating control limits. Retest data on vehicles exceeding the control limits shall not be used in determining control limits for subsequent quarters.

4. REPORTS

Reports shall be submitted to the Air Resources Board within 45 calendar days of the end of each calendar quarter and within 45 calendar days of the end of the manufacturer's model production year. Results for two different model-years shall not be combined statistically.

The report shall include:

- (a) The temporary quarterly control limit values obtained for the first quarter of production.
- (b) The mean and standard deviation of the steady-state emissions test used to determine the quarterly control limits.
- (c) The steady-state control limit values for the next quarter's production.
- (d) From a representative sample of vehicles approved by the Executive Officer, the number and percentage of vehicles:
 - (1) failing the test
 - (2) repaired or adjusted

All HC values should be stated as hexane equivalents for NDIR measurement and ppm carbon if a flame ionization detector is used. The hexane equivalent conversion value shall be supplied for each different model of flame ionization detector used and for each engine family.

C. INSPECTION TEST PROCEDURES -- 1985 - 1997 ~~AND SUBSEQUENT~~ MODEL-YEAR VEHICLES

This Inspection Test shall be performed on all 1985 - 1997 ~~and subsequent~~ model-year passenger cars, light-duty trucks and medium-duty vehicles subject to these Test Procedures. However, for 1985 model-year vehicles only, the Inspection Test Procedures set forth in Section B. of these Test Procedures may be performed in lieu of the Inspection Test Procedures set forth in this Section C. In such a case, a manufacturer may change to the Procedures set forth in this Section C. at the start of any calendar quarter in which the manufacturer starts performing the Inspection Test set forth in this Section C.

1. INSPECTION TEST PROCEDURES

Functional tests of the emission control components and systems used on the vehicle shall be conducted in accordance with a plan approved by the Executive Officer. At least 90 days prior to the start of production, the manufacturer shall submit to the Executive Officer a plan for

functional testing which lists the emission control components and systems to be tested and specifies the testing procedures to be used. Appendix B sets forth typical types of components and systems for inclusion in the functional test plan. If an on-board emission control diagnostic system of any type, either completely self-contained or requiring external peripheral equipment, is installed on a vehicle, it must be included in the components to be functionally tested and the on-board diagnostic system must be used in functionally testing the vehicle emission control system. In appropriate instances, functional tests may be conducted during the vehicle assembly process before the end of the assembly line. For components which cannot practically be functionally checked on every vehicle, a statistically valid sampling test may be used as the functional tests. The Executive Officer shall approve the plan unless he or she determines that the tests are not designated for the appropriate control components and systems or that the tests will be inadequate to reasonably assure that the components and systems are correctly installed and are functioning properly. The manufacturer may at any time submit proposed changes to the plan for functional testing. Once a plan is approved, for subsequent model-years, a manufacturer must submit a plan only if changes are made to the emission control components or systems on the vehicle, or to the proposed functional test. In the case of such changes, only the portion of the plan covering the changed components or systems, or changes in tests, must be submitted for approval. In order for a vehicle to satisfy the inspection test requirements, each of the emission control components and systems identified in the approved plan for testing must be found, pursuant to the specified approved test, to be correctly installed and functioning properly .

2. EVALUATION

Any vehicle which passes the approved functional test will be considered to be in compliance with the inspection test requirements.

3. REPORTING

Each manufacturer shall submit quarterly a statement that the functional tests included in the approved test plan have been conducted on all vehicles produced for sale in California. The statement shall be signed by an official of the manufacturer who has verified the accuracy of the statement and shall accompany the assembly-line quality audit test report for each production quarter.

D. QUALITY-AUDIT TEST PROCEDURES

1. VEHICLE SAMPLE SELECTION

The vehicle manufacturer shall randomly select vehicles from each engine family for quality-audit testing. Each selected vehicle for quality-audit testing must pass the inspection test, be equipped with emission control systems certified by the ARB, and be representative of the manufacturer's California sales. The procedure for randomly selecting vehicles must be submitted to the Chief, Mobile Source Division, El Monte, California prior to production.

A continuous sample rate shall be chosen by the manufacturer to provide a sample which is representative of the total production. The manufacturer shall select a sample rate which he or she determines will be satisfactory for use by the ARB in determining the number of vehicles in the entire population of a particular engine family which do not meet Board-established emission standards by extrapolation from the percentage of the sample not meeting the standards. The results from the sample may be extrapolated to the entire population subject to the provisions relating to vehicle exclusion contained in paragraph 3 which follows. The sample rate so chosen shall not be less than 2.0 percent except for fuel-flexible and dual-fuel vehicles where the sample rate chosen shall not be less than 1.0 percent. The manufacturer shall notify the Executive Officer of any change to the sample rate. The date of such change shall be reported in accordance with paragraph 6 which follows.

A vehicle manufacturer may use, as an alternate to the above vehicle selection procedure, the optional procedure outlined in Appendix A.

Four-wheel drive vehicles which can be manually shifted to a two-wheel drive mode will be tested in the normal on-highway two-wheel drive mode of operation. If full-time four-wheel drive vehicles are selected, substitutions may be made with comparable two-wheel drive vehicles of the same engine family. If comparable two-wheel drive vehicles are not available, selected full-time four-wheel vehicles will be tested after the front wheels temporarily disengaged or the front end of the vehicle elevated.

The Executive Officer may, upon notice to the manufacturer, require the sample rate to be increased to a maximum of ten percent of production (not to exceed 30 additional vehicles) of the calendar quarterly production of any engine family by invoking CCR, Title 13, Section 2110 Chapter 3, Title 13 of the C.A.C.

2. VEHICLE PREPARATION AND PRECONDITIONING

(a) After the inspection tests, no emissions tests may be performed on a quality-audit vehicle prior to the first quality-audit test, except where such tests are run on all vehicles manufactured for sale in California.

(b) The vehicle shall begin the test sequence as received from the inspection test, except for mileage accumulation or engine run-in. The schedule for mileage accumulation or engine run-in and any changes to the schedule must be submitted to the Executive Officer with each quarterly report. This schedule must be adhered to for all quality-audit testing within an engine family and subgroup or engine family and assembly plant as appropriate.

(c)(1) For vehicles which are certified to the running loss and useful life standards for evaporative emissions contained in Title 13, ~~California Code of Regulations~~ CCR, Section 1976(b)(1), and the incorporated "California Evaporative Emissions Standards

and Test Procedures for 1978 and Subsequent Model Motor Vehicles," last amended November 20, 1991, the vehicle preparation and preconditioning procedure shall be conducted in accordance with the evaporative emissions test procedures contained in section 4.g.i., "Test Procedure, General Requirements," subsections A.-F., as codified in subsections 4.g.ii.(c), 4.g.ii.(d), and 4.g.iii., with the exception that: (1) the cold soak prior to the preconditioning, and the fuel drain and fuel fill following the vehicle preconditioning, as described in subsections 4.g.i.B. and 4.g.i.C., respectively, may be omitted at the discretion of the manufacturer and (2) the vehicle canister loading procedure contained in subsection 4.g.iii. shall be conducted using one of the following options:

(i) The vehicle canister loading procedure shall be conducted in accordance with subsections 4.g.iii.C. and 4.g.iii.D., except that prior to the canister loading, the canister shall be cycled no less than 2 times using the method specified in subsection 4.c.iii, utilizing the fuel used in normal operation in order to place a heel on the canister. Alternative methods of loading the original canister may be used, provided such a method is approved in advance by the Executive Officer on the basis of achieving canister loading comparable to the prescribed method.

OR

(ii) The vehicle canister loading procedure described in subsections 4.g.iii.C. and 4.g.iii.D. shall be employed for a canister which is loaded separate from the vehicle, and then attached prior to the exhaust tests, with the original canister disabled. Such a canister loaded separate from the vehicle shall be identical in nominal working bed capacity, charcoal bed volume and configuration to the original canister present on the vehicle. The loading procedure for this canister shall be as described in subsections 4.g.iii.C. and 4.g.iii.D., except for the following: (1) the rate of butane loading shall not exceed 40 grams/hour, and (2) prior to the loading, the canister shall be cycled at least 2 times according to the method specified in subsection 4.c.iii utilizing the fuel used in normal operation. If the canister has been cycled for use in a previous exhaust test, this step may be omitted. An alternative to this option (ii) may be used provided such a method is approved in advance by the Executive Officer on the basis of whether the flow of vapor from the canister to the engine is comparable to the prescribed method.

OR

(iii) Data shall be submitted to the Executive Officer demonstrating the difference or lack of difference in exhaust emissions, for hydrocarbons, OMNMMHCE and carbon monoxide, between vehicles possessing a canister(s) loaded in accordance with subsections 4.g.iii.C. and 4.g.iii.D. and cycled no less

than 2 times according to the method specified in subsection 4.c.iii utilizing the fuel used in normal operation, and vehicles possessing an unloaded canister(s). For the purposes of this section, the preparation and preconditioning of vehicles with an unloaded canister shall be conducted in an identical manner as described in 2.(c)(1) of this procedure for vehicles equipped with a loaded canister, except that canister loading requirements contained in subsections 4.g.iii.C. and 4.g.iii.D. shall be omitted.

A test plan for generation of such data shall be submitted to the Executive Officer for approval prior to testing. Such testing shall involve a minimum of ten (10) vehicles for each engine family chosen to use this option, tested both with loaded and unloaded canisters. This testing shall be conducted during the first calendar quarter of production for a given model-year in order to properly apply the results to each quality-audit vehicle which is tested. Such testing shall establish a measured exhaust emissions difference for each vehicle, for hydrocarbons, OMMHCE, and carbon monoxide. For each pollutant these differences shall be averaged to generate average exhaust emissions differences (referred to below as "D"). These differences shall be applied, as an additive factor, to the applicable exhaust emissions results of each quality-audit vehicle that is not tested with a canister loaded in accordance with 2.(c)(1)(i) or 2.(c)(1)(ii). Compliance with the applicable exhaust emission standards shall be based on the sum of D and the measured quality-audit emission data for each vehicle. However, in no case shall this additive factor be applied when its value is less than zero.

(c)(2) For all other vehicles, the following procedure shall apply. A new carbon canister may be installed on the vehicle at the start of the test sequence. The test sequence shall consist of one Urban Dynamometer Driving Schedule (UDDS) test procedure, followed by a cold soak and constant volume sample (CVS) test. The federal test procedure requirement, consisting of heating the fuel before the CVS test, is to be omitted. The manufacturer may request permission to use an alternate preconditioning procedure provided the manufacturer demonstrates that it will not affect the loading of the carbon canister when compared with the UDDS).

(d) Except as provided in paragraph D.2.(f) below, no vehicle selected for quality-audit testing shall be repaired or adjusted after passing the inspection test, except for a vehicle that: (1) is not testable, e.g., cannot be started, transmission or brakes lock-up; (2) is not reasonably operative, e.g., some transmission gears not functioning; (3) is unsafe to test; or (4) would be damaged by testing.

(e) If a vehicle is shipped to a remote facility for quality-audit testing, correction of damage or maladjustment, which is found to have resulted from shipment of the vehicle, is permitted only after the initial test of the vehicle, except as provided in paragraph (d) above.

All adjustments or repairs performed on vehicles prior to each test shall be reported to the Executive Officer by inclusion in the quarterly report. The vehicle condition and symptoms and reason(s) for each repair or adjustment shall be listed. In the event a retest is performed, application may be made to the Executive Officer for permission to substitute the after-repair test results for the original test results. The Executive Officer will either affirm or deny the application. When requested by the manufacturer, no more than ten days after the production quarter, response from the Executive Officer will be within ten working days.

(f) If a vehicle is shipped to a remote facility for quality-audit testing, no pre-delivery type inspection, adjustment, or repair of vehicles selected for quality-audit is allowed, except as follows: if subsequent to shipping from the assembly-line, the manufacturer performs the particular inspection and correction of damage or maladjustment at designated preparation facility locations for all vehicles produced and the manufacturer's written inspection instructions are approved by the Executive Officer, then these specific inspections and corrections will be allowed prior to testing quality-audit vehicles.

(g) If the emission test results of a vehicle are determined to be invalid by the manufacturer, the vehicle must be retested. Emission results from all tests shall be reported. A detailed report on the reasons for each invalid test shall be included in the quarterly report.

3. STANDARDS AND TEST PROCEDURES

The emission standards and the exhaust sampling analytical procedures shall be those described in the "CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 1981 AND SUBSEQUENT MODEL PASSENGER CARS, LIGHT-DUTY TRUCKS, AND MEDIUM-DUTY VEHICLES" or "CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 1988 AND SUBSEQUENT MODEL PASSENGER CARS, LIGHT-DUTY TRUCKS, AND MEDIUM-DUTY VEHICLES", as applicable, for vehicles tested for exhaust emissions only, with exceptions or additions as shown in paragraph D.2.

4. EVALUATION

The evaluation shall be performed on sample sizes containing 30 or more vehicles. If a sample size for a particular production quarter is less than 30 vehicles, the data from that quarter shall be combined with all the data from each successive quarter until data from at least 30 vehicles have been quality-audit tested is included in the quarterly evaluation. If a sample size for a particular production quarter is less than 30 vehicles, the data from that quarter shall be combined with all the data from each successive quarter until data from at least 30 vehicles have been quality-audit tested is included in the quarterly evaluation. If the sample size for the last final

quarter's production for a model year does not contain at least 30 vehicles, the data from the last final quarter shall be combined with all the data from each preceding quarter until the sample size contains at least 30 vehicles. For an engine family which contains both light-duty trucks and medium-duty vehicles, all references in this test procedure to engine family shall mean light-duty truck subgroup or medium-duty vehicle subgroup.

Based upon additional information submitted by a manufacturer, the Executive Officer may allow rejection of any data from vehicles if they are considered to be not representative of production.

For each production quarter, if 30 or more vehicles are tested, the ARB shall consider that p Probable cause exists for finding a violation by any engine family if the average emissions of any pollutant, after multiplying the emission data of each vehicle by the appropriate certification deterioration factor (DF), exceed the applicable year exhaust emission standards, when rounded to the same number of significant digits as the standard.

The Executive Officer may invoke Section 2109, ~~Chapter 3~~, Title 13 of the CCR, if probable cause is found for a full or combined production quarter. The Executive Officer may invoke Section 2110, Chapter 3 Title 13 of the CCR, if probable cause is found for a short start-up production period (less than a full calendar quarter), for the first 30 vehicles quality-audit tested during any production quarter or from the start of production, or for vehicles evaluated in accordance with the monthly evaluation required by paragraph 6 below. In addition, the ARB may seek statutory penalties pursuant to H & SC Sections 43211 and 43212 at the end of each full or combined calendar quarter of production. If the Executive Officer invokes CCR Section 2109 or 2110, an evaluation will be made on vehicles produced subsequent to the invocation of a plan adopted pursuant to Section 2109 or 2110 as long as the sample size contains at least 30 vehicles.

If more than 1.0 percent (at least 2 vehicles) of the sample within an engine family has projected emissions which exceed the applicable standards by more than 2.33 standard deviations at the time of any evaluation of that family's average emissions; within 30 working days, the manufacturer shall submit:

- (a) an analysis of the projected average emissions for each engine code/transmission type/inertia weight combination within that family;
- (b) an engineering evaluation of the cause of failure for each vehicle;
- (c) the manufacturer's opinion as to the nature of the problem; and
- (d) any corrective action proposed by the manufacturer.

The Executive Officer shall review the report, and may require that the proposed corrective action be taken. If, after review of the report, the Executive Officer finds the proposed corrective action inadequate, the Executive Officer may invoke Section 2109 or 2110, as appropriate.

5. HYDROCARBON (HC) MEASUREMENTS

(a) For an engine family certified to non-methane hydrocarbon (NMHC) standards, the manufacturer shall measure the NMHC content which shall be multiplied by the NMHC DF.

(b) For an engine family certified to total hydrocarbon (THC) standards, the measured THC values shall be multiplied by the THC DF.

(c) For an engine family certified to organic material hydrocarbon equivalent (OMHCE) or organic material non-methane hydrocarbon equivalent (OMNMHCE) standards, the manufacturer shall measure the OMHCE or OMNMHCE content which shall be multiplied by the OMHCE or OMNMHCE DF. As an alternative to measuring the OMHCE or OMNMHCE content, the Executive Officer may approve, upon submission of supporting data by a manufacturer, the use of OMHCE or OMNMHCE to NMHC ratios. To request the use of OMHCE or OMNMHCE to NMHC ratios, the manufacturer shall establish during certification testing the ratio of measured OMHCE or OMNMHCE exhaust emissions to measured NMHC exhaust emissions for each certification test data vehicle for the applicable engine family. The average of the individual test ratios of measured OMHCE or OMNMHCE to NMHC emissions for the engine family shall be submitted to the Executive Officer in the application for certification. Following approval of the application for certification, the manufacturer may conduct quality-audit testing on the engine family by measuring NMHC exhaust emissions rather than OMHCE or OMNMHCE exhaust emissions. The measured NMHC exhaust emissions shall be multiplied by the OMHCE or OMNMHCE to NMHC ratio submitted in the application for certification for the engine family to determine the equivalent OMHCE or OMNMHCE exhaust emission values for the quality audit test vehicle. The equivalent OMHCE or OMNMHCE exhaust emission values shall be compared to the OMHCE or OMNMHCE exhaust emission standard applicable to the engine family.

(d) For an engine family certified to non-methane organic gas (NMOG) standards, the manufacturer shall measure the NMOG content which shall have be multiplied by the NMOG DF and the reactivity adjustment factor and ozone DF, if applicable. As an alternative to measuring the NMOG content, the Executive Officer may approve, upon submission of supporting data by a manufacturer, the use of NMOG to NMHC ratios. To request the use of NMOG to NMHC ratios, the manufacturer shall establish during certification testing the ratio of measured NMOG exhaust emissions to measured NMHC exhaust emissions for each certification test data vehicle for the applicable engine family. The average of the individual test ratios of measured NMOG to NMHC emissions for the engine family shall be submitted to the Executive Officer in the application for certification. Following approval of the application for certification, the manufacturer may conduct quality-audit testing on the engine family by measuring NMHC exhaust emissions rather than NMOG exhaust emissions. The measured NMHC exhaust

emissions shall be multiplied by the NMOG to NMHC ratio submitted in the application for certification for the engine family to determine the equivalent NMOG exhaust emission values for the quality audit test vehicle. The equivalent NMOG exhaust emission value shall be used in place of the measured NMOG exhaust emission value in determining the reactivity adjusted exhaust NMOG results. The equivalent reactivity adjusted NMOG exhaust emission values shall be compared to the NMOG exhaust emission standard applicable to the vehicle emission category (TLEV, LEV, or ULEV) in which the engine family was certified.

(e) For fuel-flexible vehicles certified to either organic material non-methane hydrocarbon equivalent (OMNMHCE) or non-methane organic gas (NMOG) standards, the manufacturer may request from the Executive Officer the use of a methanol (M85) exhaust emission to gasoline NMHC exhaust emission ratio which shall be established during certification testing for each certification test data vehicle for the applicable engine family. The average of the individual test ratios of measured M85 NMOG to gasoline NMHC emissions for the engine family shall be submitted to the Executive Officer in the application for certification. Following approval of the application for certification, the manufacturer may conduct quality- audit testing on the engine family by measuring gasoline NMHC exhaust emissions rather than M85 NMOG exhaust emissions. The measured gasoline NMHC exhaust emissions shall be multiplied by the M85 NMOG to gasoline NMHC ratio submitted in the application for certification for the engine family to determine the equivalent NMOG exhaust emission values for the quality audit test vehicle. The equivalent NMOG exhaust emission value shall be used in place of the measured NMOG exhaust emission value in determining the reactivity adjusted exhaust NMOG results. The equivalent reactivity adjusted NMOG exhaust emission values shall be compared to the NMOG exhaust emission standard applicable to the vehicle emission category (TLEV, LEV, or ULEV) in which the engine family was certified. Manufacturers which choose this option shall test the full two percent of the vehicles selected for quality-audit testing.

(f) For 1993 and 1994 model-year vehicles, the manufacturer has the option of using the fuel meeting the specifications set forth in Section 9.a(1), 9.a(1)(i), or 9.a(1)(ii) of the California Exhaust Emission Standards and Test Procedures for 1988 and Subsequent Model Passenger Cars, Light-Duty trucks and Medium-Duty Vehicles for purposes of quality audit testing. All 1995 through 1997 model-year ~~and subsequent~~ conventional and low-emission vehicles which certify with fuel meeting the specifications set forth in Section 9.a(1) of the California Exhaust Emission Standards and Test Procedures for 1988 and Subsequent Model Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles must use that fuel for purposes of quality audit testing. All 1995 through 1997 model-year ~~and subsequent~~ conventional and low-emission vehicles which certify with fuel meeting the specifications set forth in Section 9.a(1)(ii) of the California Exhaust Emission Standards and Test Procedures for 1988 and Subsequent Model

Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles must use that fuel for purposes of quality audit testing.

6. FORMALDEHYDE (HCHO) MEASUREMENTS

For an engine family certified to HCHO standards, the manufacturer shall measure the HCHO content which shall be multiplied by the HCHO DF. As an alternative to measuring the HCHO content, the Executive Officer may approve, upon submission of supporting data by a manufacturer, the use of HCHO to NMHC ratios. To request the use of HCHO to NMHC ratios, the manufacturer shall establish during certification testing the ratio of measured HCHO exhaust emissions to measured NMHC exhaust emissions for each certification test data vehicle for the applicable engine family. The average of the individual test ratios of measured HCHO to NMHC emissions for the engine family shall be submitted to the Executive Officer in the application for certification. Following approval of the application for certification, the manufacturer may conduct quality-audit testing on the engine family by measuring NMHC exhaust emissions rather than HCHO exhaust emissions. The measured NMHC exhaust emissions shall be multiplied by the HCHO to NMHC ratio submitted in the application for certification for the engine family to determine the equivalent HCHO exhaust emission values for the quality audit test vehicle. The equivalent HCHO exhaust emission values shall be compared to the HCHO exhaust emission standard applicable to the engine family.

7. REPORTS

Each vehicle manufacturer shall submit a quality audit test report to the ARB within 45 calendar days after the end of each calendar quarter and 45 calendar days after the end of the production year. More frequent reports may be required if the Executive Officer invokes CCR Section 2109 or 2110, Chapter 3, Title 13. Each vehicle manufacturer shall review the test results of the first 30 test vehicles of each engine family for each calendar quarter of production or from the start of production, and the quarter's cumulative test results of each engine family at the end of each month. If the sample size is 30 or more vehicles, the Chief, Mobile Source Division, shall be notified in writing within ten working days whenever an engine family exceeds an emission standard.

The quarterly report shall include the following:

(a) The total production and sample size for each engine family, and the total number of vehicles certified to TLEV, LEV, ULEV or zero-emission vehicle (ZEV) standards and produced and delivered for sale in California in each of the following vehicle classifications: 1) passenger cars and light-duty trucks 0-3750 lbs. loaded vehicle weight, 2) light-duty trucks 3751-5750 lbs. loaded vehicle weight, and 3) medium-duty vehicles.

(b) A description of each test vehicle (i.e., date of test, engine family, engine size, vehicle identification number, fuel system (e.g., number of venturi, fuel injection,

etc.), transmission type, test weight used, dynamometer power absorber setting in horsepower, engine code or calibration number, and test location).

(c) The CVS exhaust emission data and carbon dioxide emission data for each test vehicle. For methanol vehicles not certified as TLEVs, LEVs, or ULEVs, OMHCE or OMNMHCE data shall be substituted for NMHC or THC data, and formaldehyde (HCHO) data shall also be submitted. For vehicles certified as TLEVs, LEVs, or ULEVs, NMOG data shall be substituted for NMHC or THC data, and HCHO data shall also be submitted.

The data reported shall be rounded to one significant figure beyond the number of significant figures in the applicable standard. DF's shall be stated, then applied to the data. The data reported After the DF's are applied, shall be rounded using the rounding off method specified in ASTM E29-67 to the number of places to the right of the decimal point indicated below, in accordance with the emission standards to which the vehicle was certified:

THC, NMHC, or OMNMHCE	NMOG	CO	NO _x	HCHO	CO ₂
.XXX	.XXXX	.XX	.XX or .XXX	.XXXX	.X

(d) The retest emissions data, as described in paragraph (c) above, for any vehicle failing the initial test, and description of the corrective measures taken, including specific components replaced or adjusted.

(e) A statistical analysis of the quality-audit test results for each engine family stating:

(1) Number of vehicles tested.

(2) Average emissions and standard deviations of the sample for HC, or OMHCE or OMNMHCE or NMOG, as applicable, CO, NO_x, and HCHO, as applicable, both before and after applying DF's, reactivity adjustment factors, and ozone DF's, as applicable. In the latter case, the individual test points shall be multiplied by the DF's, reactivity adjustment factors, and ozone DF's, as applicable, prior to computing the average and standard deviation. The average emissions and standard deviation of the sample for carbon dioxide shall also be listed.

(3) The applicable exhaust emission standards to be met by listing specific options selected, designating when 100,000 mile standards apply, and

designation where NMHC, THC, OMHCE, OMNMHCE, or NMOG standards apply.

(f) Every aborted test and reason for abort shall be reported.

(g) If both four-wheel and two-wheel drive vehicles are included in a light-duty truck engine family under 4,000 pounds inertia weight, the quality-audit test data from four-wheel drive vehicles shall be distinguished from and summarized separately from two-wheel drive vehicles.

(h) The final report shall include the date of the end of the manufacturer's model production year for each engine family.

(i) If vehicles from different model-years are produced in any production quarter, separate reports shall be submitted for each model-year.

(i) For federally certified light-duty vehicles produced under the provisions of H & SC 43102(b), the emissions data and other information required in the quarterly reports shall be included in a separate section of the report. Where such federally certified light-duty vehicles are in the same engine family as medium-duty vehicles, all data from these medium-duty vehicles shall be deleted from the separate section. The separate section shall include the statistical summary required by Section (e)(2). The separate section of the report shall also include identical data for California engine families used for offsetting emissions of federally certified light-duty vehicles.

8. SPECIAL REQUIREMENTS FOR SMALL VOLUME MANUFACTURERS

The following requirements apply only to those vehicle manufacturers who were granted relief by the Executive Officer under Title 13, C.A.C., Section 1960.4, Special Standards for 1982 and Subsequent Model Passenger Cars and 1983 and Subsequent Model Light-Duty Trucks and Medium-Duty Vehicles, 0-3999 Pound Equivalent Inertia Weight.

The requirements listed below are to be followed as supplemental to and when contrary to other requirements specified in part D. "Quality-Audit test Procedures", Sections "4. Evaluation", and "6. Reports". These requirements are listed to implement, define, and clarify the Board requirements of C.A.C. Section 1960.4.

(a) Additional Reporting Requirements for NO_x Emissions

(1) The cumulative average of NO_x emissions from the entire quality-audit light-duty trucks (LDT) plus medium-duty vehicles (MDV) 0-3999 lbs. equivalent inertia weight, shall be reported both before and after applying DF's for the 1983 model-year to:

(i) All 1983 models tested during each calendar

quarter.

- (ii) All 1983 models tested to date by the end of each calendar quarter.
- (iii) All 1983 models tested to date by December 31, 1982, by June 30, 1983, and by December 31, 1983.

(2) The combined averages from the entire passenger car (PC) line and, separately, LDT and MDV lines, 0-3999 lbs. equivalent inertia weight, shall be reported both before and after applying DF's for:

- (i) All 1983 model PC's tested during each calendar quarter.
- (ii) All 1984 model PC's and, separately, LDT's plus MDV's tested during each calendar quarter.
- (iii) All 1985 model LDT's plus MDV's tested during each calendar quarter.

(3) Subgroups

The NOx emission results shall be averaged and reported by engine family subgroup in each regular quarterly assembly-line report.

(b) Semi-Annual Evaluations

Joint ARB - manufacturer evaluations will be made each six months to determine compliance with the 0.7 g/mi NOx production level based on test results by engine families separately for 1983 and 1984 model PC's and 1984 and 1985 model LDT's plus MDV's tested and on a cumulative basis for 1983 model LDT's plus MDV's. The first evaluation will be made based on averaged NOx test data accumulated through December 31, 1982. Subsequent evaluations will be made semiannually for data accumulated through each June 30 and December 31 periods until December 31, 1984 for PC's and December 31, 1985, for LDT's plus MDV's model year productions.

If the NOx value exceeds the 0.7 g/mi level, but the manufacturer shows that unanticipated technical problems caused the 0.7 g/mi NOx production average to be exceeded, then appropriate relief will be made available. The relief will be made provided the manufacturer shows reasonable effort was made and will continue to be made towards meeting the 0.7 g/mi NOx levels for future production periods. This includes

incorporating into production improved technology as soon as it becomes available.

After the evaluation, the Executive Officer can revoke Section 2109, Title 13 of the ~~C.C.R~~ CCR, if combined test results exceed the 0.7 g/mi NOx level separately for 1983 and 1984 model PC's and 1984 and 1985 model LDT's plus MDV's, and on a cumulative basis for 1983 model LDT's plus MDV's provided that the manufacturer has not taken appropriate action.

DEFINITIONS

The definitions in CCR Title 13 Section 1900 (b) shall apply with the following additions:

1. Calendar Quarter is defined as those three month period of time which start on the first days of January, April, July and October.
2. First or Final Calendar Quarter Production is defined as the calendar quarter in which the production of an engine family begins or ends.
3. End of Assembly-Line is defined as that place where the final inspection test or quality-audit test is performed.
4. Assembly-Line Tests are those tests or inspections which are performed on or at the end of the assembly-line.
5. Assembly-Line Quality Audit-Test is defined as the test performed on a minimum sample of 2.0 percent (or other approved sample) of the production vehicles for sale in California.
6. Assembly-Line Inspection Tests are those tests performed pursuant to Section B of these procedures.
7. Functional Test is defined as a type of test or inspection which is performed on engines or vehicles to detect if the emission control system is operating properly.

APPENDIX A

ALTERNATE QUALITY-AUDIT VEHICLE SELECTION CRITERIA

This appendix sets forth the alternative procedure for selection of Quality-Audit vehicles. It includes the flow diagram in Figure A-1.

1. Vehicles shall be randomly selected at a rate of 2.0 percent of engine family production at the beginning of production. When test results of 30 vehicles have been accumulated, an evaluation as indicated below shall be made.
2. Calculate the family mean and standard deviation of each pollutant (HC, CO, NO_x). Identify vehicles which have emission levels greater than three standard deviations above the mean. Eliminate these emission data points and recalculate the mean and standard deviation. Continue the calculation until there are no values greater than three standard deviations above the mean. Count the number of these data points greater than the standard (outliers). If the number of outliers is equal to or less than the allowable number in Table A-1 for each pollutant, the engine family is eligible to continue to a second evaluation shown in paragraph 3 below. Otherwise, sampling must continue at a rate of 2.0 percent of production for the rest of the month.
3. If the allowable outlier criteria is met, the family mean, standard deviation, and sample size determined for each contaminant before excluding any outliers, is substituted in the following expression:

$$\frac{(\text{emission standard} - \text{mean}) (N^{1/2})}{(\text{standard deviation})}$$

If the expression is greater than C in Table A-2 below, and the manufacturer reasonably estimates that the quarterly engine family production will exceed 5,000 vehicles, the sampling rate for the remaining portion of the calendar month following the date of selection of the last of the 30 vehicles shall be 30 per month, applied on a prorated basis. If the expression is greater than C in Table A-2 below, and the manufacturer reasonably estimates that the quarterly engine family production will be 5,000 vehicles or less, the sampling rate for the remaining portion of the calendar month following the date of selection of the last of the 30 vehicles shall be 17 per month, applied on a prorated basis. If the expression is equal to or less than C in Table A-2, the sampling rate shall continue to be 2.0 percent of production for the remaining portion of the month in which selection of the 30 vehicles is completed. The value of C is a function of the coefficient of variation (standard deviation/mean). The coefficient of variation and "C" shall be rounded to the number of decimal places shown in Table A-2.

Table A-1

Sample Size	Allowable Outliers	Sample size	Allowable Outliers
1- 32	1	430-478	11
33- 68	2	479-528	12
69-107	3	529-578	13
108-149	4	579-629	14
150-193	5	630-680	15
194-238	6	681-731	16
239-285	7	732-783	17
286-332	8	784-835	18
333-380	9	836-887	19
381-429	10	888-939	20

Table A-2

Coefficient of Variation	C
0.1	0.5
0.2	1.2
0.3	1.8
0.4	2.5
0.5	3.1
0.6	3.8
0.7	4.4
0.8	5.1
0.9	5.7

4. For each remaining calendar month in the quarter, both mathematical procedures set forth in paragraph 2 and 3 shall be repeated at the end of the preceding month, using all of the test data accumulated in the quarter. The sampling rate for each remaining calendar month in the quarter shall be 30 vehicles per month, 17 vehicles per month, or 2.0 percent of the production as determined under the standards in paragraph 3.

5. At the end of the quarter, all of the data accumulated during the quarter is evaluated, and the compliance of the family with emission standards is determined.

6. For each subsequent quarter, the preceding sample selection method shall be followed. The sample rate determination for the first month of each subsequent quarter shall be based on the accumulated data from the previous quarter. The sample rate for the succeeding months of the quarter shall be determined as previously set forth.

7. If the start of production does not coincide with the first of a quarter, the sequence for sample rate determination shall be followed, but references to remaining calendar months may not be appropriate.

8. Where a manufacturer has sampled vehicles at a rate of 17 per month following a reasonable estimate that the quarterly engine family production will be 5,000 vehicles or less, and subsequently determines, or reasonably should determine based on information available to the manufacturer, that the quarterly engine family production will exceed 5,000 vehicles, the manufacturer shall increase the sampling rate for the quarter such that the requirements of paragraph 3 applicable to families reasonably estimated to exceed a quarterly production of 5,000 vehicles are satisfied.

FIGURE A-1

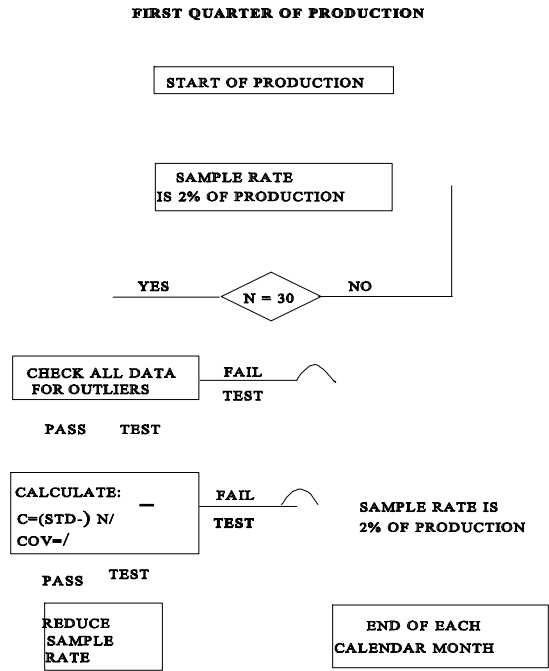
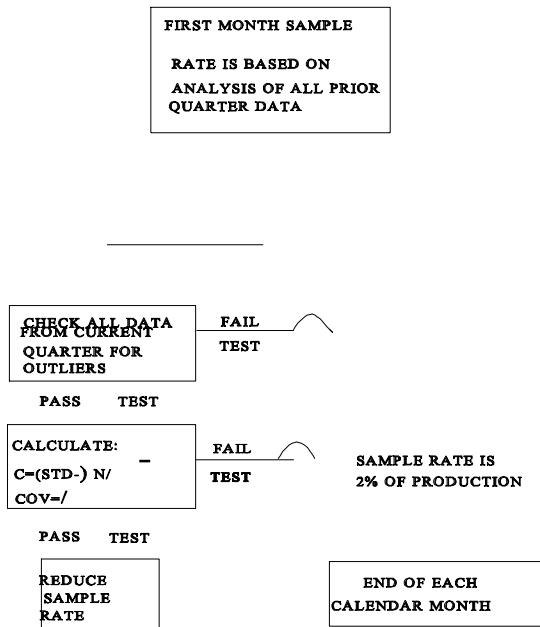


FIGURE A-1

SUBSEQUENT QUARTERS



**FIGURE A-1
OUTLIER CALCULATION PROCEDURE**

1. CALCULATE THE MEAN AND STANDARD DEVIATION FOR EACH POLLUTANT WITH DF APPLIED.
2. CALCULATE THE MEAN PLUS THREE STANDARD DEVIATIONS.
3. IDENTIFY ALL EMISSION DATA GREATER THAN $\bar{X} + 3s$ STANDARD DEVIATIONS.
4. REMOVE THE OUTLIERS FROM THE DATA AND RECALCULATE THE MEAN AND STANDARD DEVIATION.
5. REPEAT STEPS 2, 3, 8, 4.
6. REPEAT STEPS 2, 8, 3
7. IDENTIFY ALL OUTLIERS THAT EXCEED APPLICABLE CERTIFICATION STANDARD AND COUNT THE NUMBER.
8. COMPARE THE NUMBER OF OUTLIERS WITH THE MAXIMUM ALLOWED BY THE OUTLIER TABLE. IF THE NUMBER OF OUTLIERS EXCEEDS THE MAXIMUM, SAMPLE RATE IS 2.0% OF PRODUCTION. IF THE NUMBER IS LESS THAN THE MAXIMUM ALLOWED, CALCULATE "C".

APPENDIX B

EMISSION CONTROL COMPONENTS AND SYSTEMS

Air Diverter Valve
Air/Fuel Control System
Air Injection Control Valves
Air Injection Pump
Camshaft Position Sensor
Canister Purge Valve
Carburetor or Fuel Injection System
Catalyst
Choke
Controlled Air Intake System
Coolant Temperature Sensor
Crankshaft Position Sensor
Diesel Particulate Control System
Distributor
EGR Control System Components
Electronic (Computer) Control System
Emissions Related Hoses, Tubing, Clamps, Belts, Fittings, Wiring,
Connectors, Sensors and Switches.
Evaporative System
Exhaust Gas Recirculation
Ignition Coil & Wires
Ignition Control Module
Intake Air Temperature Sensor
Malfunction Indicator Light (MIL)
Mass Air Flow Sensor
Misfire Detection System
On-Board Diagnostic System
Oxygen Sensor
Positive Crankcase Ventilation
Power Train Control Module (Built-in test, BIT)
Throttle Position Sensor
Vacuum Hose Connections